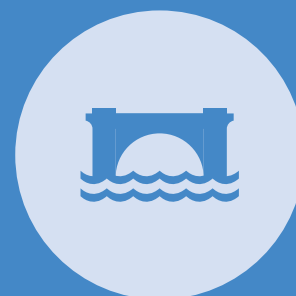


Crossings

3.5 Single Span Bridge River Crossings



There are a variety of bridges used for forestry purposes. Beam and deck construction are common. Beams are usually steel “I”, stressed concrete, steel truss, post-tensioned treated LVL or glue-laminated treated sawn lumber. Decks are pre-stressed concrete or timber. Shorter decks may be made from concrete slabs.

Bridges typically cost more to construct than *culverts* or low-level crossings. In some instances, temporary portable bridges are used for short-term harvesting and transport access. These are designed for rapid construction and dismantling. Most consist of prefabricated combined beams and decking.



Examples of single span bridges using structural steel and reinforced concrete.

This guide is provided as a reference document and does not constitute a statutory obligation under the Resource Management Act 1991 or the National Environmental Standards for Plantation Forestry.

Please refer to the ‘how to use’ section of the introduction at <http://docs.nzfoa.org.nz/forest-practice-guides/> for advice on how to use this guide.

Version 2.0, January 2020

Crossings

3.5 Single Span Bridge River Crossings



A Where and when to use

1. Bridges are recommended for the following conditions:
 - a. Rivers that have large and variable water flow.
 - b. Rivers that have high *river* banks and where a *culvert* would require a significant *fill*.
 - c. High debris potential or *river* bed load movement where a *culvert* would likely block.
 - d. Steep *river* bed gradient with high water energy (*culverts* are less suitable).
 - e. Sensitive *river* bed and banks that require minimal disturbance.
 - f. Where *culverts* or other river crossings are not appropriate.
2. The advantages of bridges over other *river* crossing structures include:
 - a. Reduced or no modification to the *river* bed and banks.
 - b. No barrier to fish passage.
 - c. Reduced erosion, as the channel capacity has generally not been changed by structures within the *river* bed.
 - d. Typically low ongoing maintenance.
 - e. Useable regardless of weather.

B Where not to use

Not applicable for this FPG.

C Design

1. Bridges require specialist engineering design and construction supervision. Given the costs and risks involved, it is recommended that flood and other design calculations are peer reviewed.
2. Almost all bridges will require a Building Permit and Code Compliance Certificate under the Building Act 2004 from the District Council.
3. Permanent bridges must pass at least a 1 in 50-year flood event (2% AEP). Allow at least 1 m of freeboard above the calculated maximum water level to ensure floating debris does not damage the structure or design the bridge to allow for overtopping.
4. Locate the bridge crossing site to meet these criteria if possible:
 - a. On a straight and uniform reach of *river*, to reduce scour of the *abutments* or bridge approaches.
 - b. At a narrow point – span length affects cost.
 - c. Where the crossing is square on to the *river* – to manage span length.
 - d. With stable *river* banks at the bridge site and upstream of the crossing.
5. Factor in potential natural channel adjustment changes over the bridge's design life.
6. Avoid bridge design that places structural foundations on soil susceptible to erosion or structural failure.

Crossings

3.5 Single Span Bridge River Crossings



D Construction

1. Construct in suitable weather.
2. Check for any fish spawning timing constraints under the NES-PF.
3. Limit earthwork disturbance to the immediate construction site – which may include an area up and downstream of the bridge site if the approaches and *abutments* need strengthening or protection from *river* bank erosion.
4. Minimise the need for machinery to operate in flowing water.
5. Construct foundations onto non-erosion prone material, preferably rock. If this is not possible, then build to below the maximum level of potential erosion, or provide an acceptable alternate engineering solution.
6. Bridge *abutments* or footings should be on natural ground. This ensures that the length of the bridge is wider than the *river* channel and provides a good bed for the bridge.
7. Wet or curing concrete must not be in contact with flowing water. Cement is a contaminant and is toxic to invertebrates and fish. When pouring concrete, the water channel will need to be temporarily diverted.
8. Elevated *sediment* discharge levels will occur during construction but must not occur for more than eight consecutive hours.
9. Protect the *abutments*, footings and approaches. If necessary, armour with concrete, rip rap, *gabions*, wing walls and other deflectors.
10. Limit *sediment* entering the *river* from the road approaches by:
 - a. Raising the bridge deck slightly or lowering the road approaches, to direct stormwater away from the *river* if possible.
 - b. Diverting road surface water off the bridge approaches, as close as practicable to the bridge, and ideally within 10 m. Use stormwater and *sediment* control measures such as *berms*, *cut-outs*, *water table* drains and *culverts*, *flumes* and *sediment* traps.
 - c. Using clean gravel on road approaches where the existing road surface could create a *sedimentation* problem.
 - d. Minimising the potential for aggregate being tracked onto the bridge.
11. Check regularly during and on completion of construction. If the work does not meet the design plan and standards then initiate corrective actions.
12. At the end of construction all excess equipment and materials must be removed from the *river* bed within five working days.

E Maintenance

1. Prepare a routine maintenance plan including heavy rainfall response measures.
2. Initiate a regular two-year engineering inspection programme. Maintenance includes repairing *river* bank protection measures, and cleaning signs, kerb rails, the deck and the girder seatings.

National Environmental Standards for Plantation Forestry

Particular relevant provisions for bridges are Regulations 38 – 49.

Refer also to the Department of Conservation **Fish Passage Guidelines**: <https://www.doc.govt.nz/nature/habitats/freshwater/fish-passage-management/nz-fish-passage-guidelines/>

Crossings

3.5 Single Span Bridge River Crossings



Examples



Contact



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www.nzfoa.org.nz

Other Practice Guides in this series



3.1 Battery Culvert River Crossings



3.2 Drift Deck River Crossings



3.3 Ford Crossings



3.4 Single Culvert River Crossings



3.5 Single Span Bridge River Crossings



3.6 Temporary Crossings

Visit:
<https://docs.nzfoa.org.nz/forest-practice-guides/>
to view all guides